

# Technical Information

## CCS120D

Digital sensor with Memosens technology for determining total chlorine

CCS120D offers high-precision measurement with long-term stability to guarantee optimum process monitoring.

### Application

Memosens CCS120D measures total chlorine in:

- Wastewater treatment plants
  - Disinfection monitoring and control in wastewater outlet
  - Reuse of outlet water
- Utilities of all industries
  - All disinfection measuring points

### Your benefits

- Easy handling thanks to Memosens digital technology
- Enables predictive maintenance due to storage of sensor and process-specific data
- Low maintenance thanks to fast exchange of membrane cap and electrolyte
- Flexible installation in CYA112 immersion assembly or CCA250 flow assembly
- Easy combination with other relevant parameters of liquid analysis thanks to connection to the Liquiline multichannel transmitter

### Other advantages provided by Memosens technology

- Maximum process safety
- Data security thanks to digital data transmission
- Very easy to use as sensor data are saved in the sensor
- Predictive maintenance can be performed by recording sensor load data in the sensor



## Function and system design

### Measuring principle

Total chlorine levels are determined in accordance with the amperometric measuring principle.

In this context, the following compounds are referred to collectively as total chlorine:

- Free available chlorine: hypochlorous acid (HOCl), hypochlorite ions (OCl<sup>-</sup>)
- Combined chlorine (chloramines)
- Organic combined chlorine, e.g. cyanuric acid derivatives

Chloride (Cl<sup>-</sup>) is not recorded.

The sensor is a membrane-covered, two-electrode sensor. A platinum working electrode is used as the working electrode. A counter electrode coated in silver halide is used as the counter and reference electrode.

The membrane cap, which is filled with electrolyte, constitutes the measuring chamber. The measuring electrodes are immersed in the measuring chamber. The measuring chamber is separated from the medium by means of a microporous membrane. The chlorine compounds contained in the medium diffuse through the sensor membrane.

The constant polarization voltage present between the two electrodes causes the electrochemical reaction of the chlorine compounds at the working electrode. Electron donation at the working electrode and electron acceptance at the counter-electrode cause a current to flow. In the operational range of the sensor, this current flow is proportional to the chlorine concentration under constant conditions and is only slightly pH-dependent in the case of this sensor type. The transmitter uses the current signal to calculate the measured variable for concentration in mg/l (ppm).

### Operating principle

The sensor consists of:

- Membrane cap (measuring chamber with membrane)
- Sensor shaft with counter-electrode with large surface area and a working electrode embedded in plastic

The electrodes are in an electrolyte which is separated from the medium by a membrane. The membrane prevents the electrolyte from leaking and protects against contaminant penetration.

The measuring system is calibrated by means of a colorimetric comparison measurement in accordance with the DPD method for total chlorine. The calibration value determined is entered in the transmitter.

### Cross-sensitivities <sup>1)</sup>

Oxidants, such as bromine, iodine, ozone, chlorine dioxide, permanganate, peracetic acid and hydrogen peroxide result in higher readings than expected.

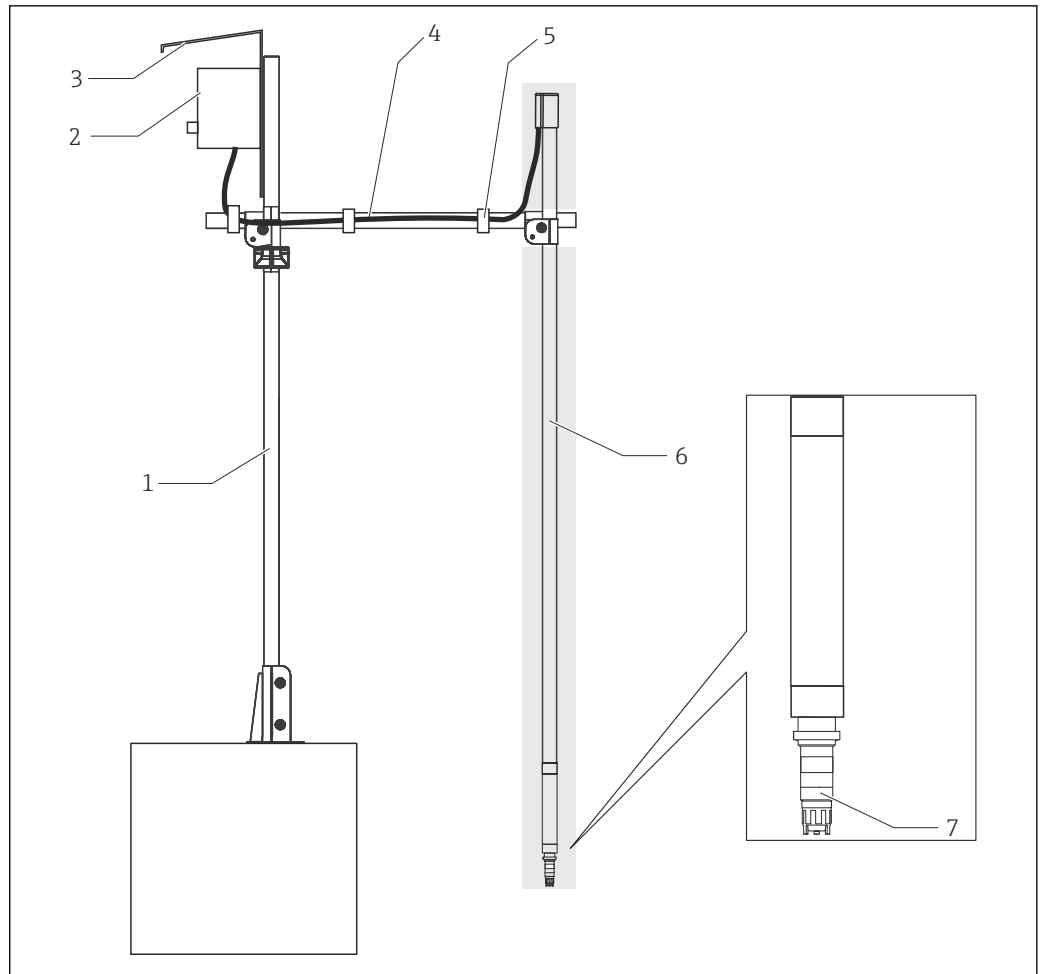
Reducing agents, such as sulfides, sulfites, thiosulfates and hydrazine, result in lower readings than expected.

### Measuring system

A complete measuring system comprises:

- CCS120D disinfection sensor (membrane-covered)
- Flexdip CYA112 immersion assembly
- Measuring cable CYK10, CYK20
- Transmitter, e. g. Liquiline CM44x with firmware version 01.06.08 or higher or CM44xR with firmware version 01.06.08 or higher
- Optional: extension cable CYK11
- Optional: Flowfit CCA250 flow assembly (a pH/ORP sensor can additionally be installed here)

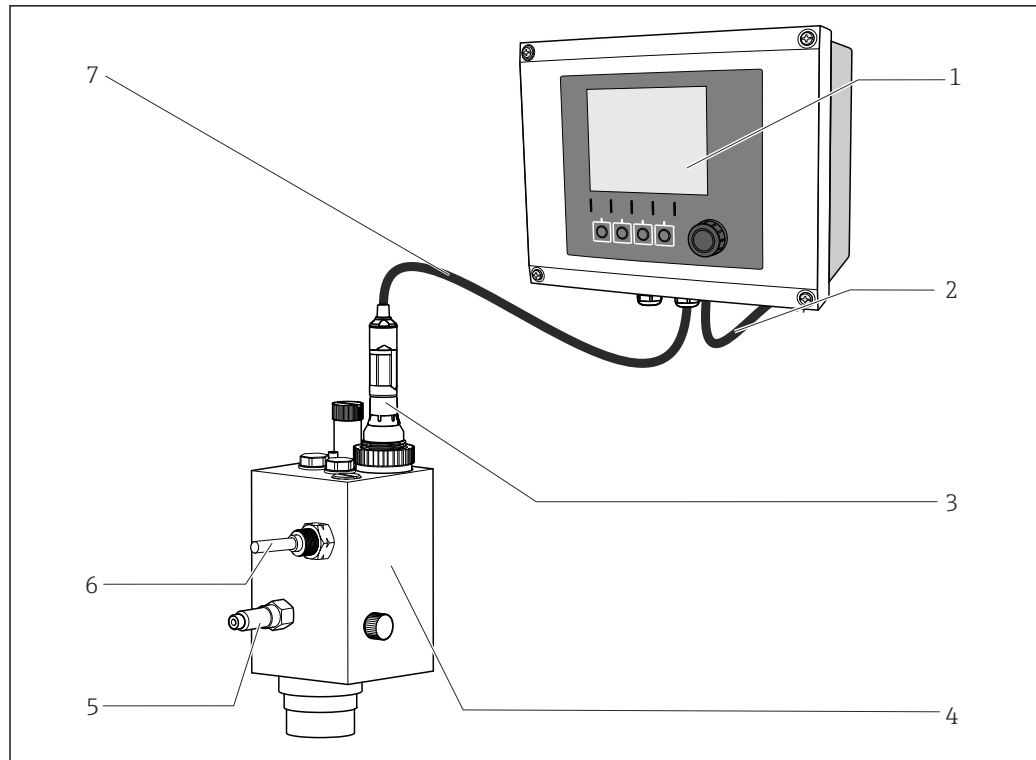
<sup>1)</sup> The listed substances have been tested individually and with different concentrations. A reaction to mixtures was not investigated.



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1 Example of a measuring system

- 1 CYH112 holder, main pipe
- 2 Transmitter
- 3 Protective cover
- 4 CYH112 holder, transverse pipe
- 5 Hook-and-loop tape
- 6 CYA112 assembly (gray background)
- 7 Disinfection sensor CCS120D (membrane-covered,  $\varnothing 25$  mm)



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2 Example of a measuring system

- 1 Liquiline CM44x transmitter
- 2 Power cable for transmitter
- 3 Disinfection sensor CCS120D (membrane-covered,  $\varnothing 25$  mm)
- 4 Flowfit CCA250 flow assembly
- 5 Inlet to Flowfit CCA250 flow assembly
- 6 Proximity switch (optional)
- 7 Measuring cable CYK10

## Reliability

## Dependability

### Memosens

Memosens makes your measuring point safer and more reliable:

- Non-contact, digital signal transmission enables optimum galvanic isolation
- Dust- and waterproof (IP 68)
- Sensor can be calibrated in a lab, thus increasing the availability of the measuring point in the process
- Predictive maintenance thanks to recording of sensor data, e.g.:
  - Total hours of operation
  - Hours of operation with very high or very low measured values
  - Hours of operation at high temperatures
  - Calibration history

### Ease of maintenance

#### Easy handling

Sensors with Memosens technology have integrated electronics that store calibration data and other information (e.g. total operating hours or operating hours under extreme measuring conditions). Once the sensor has been connected, the sensor data are transferred automatically to the transmitter and used to calculate the current measured value. As the calibration data are stored in the sensor, the sensor can be calibrated and adjusted independently of the measuring point. The result:

- Easy calibration in the measuring lab under optimum external conditions increases the quality of the calibration.
- Pre-calibrated sensors can be replaced quickly and easily, resulting in a dramatic increase in the availability of the measuring point.
- The availability of sensor data means that maintenance intervals can be accurately defined and predictive maintenance is possible.
- The sensor history can be documented with external storage media and evaluation programs.
- The application range of the sensor can be determined based on its previous history.

**Safety**

**Data security thanks to digital data transmission**

Memosens technology digitizes the measured values in the sensor and transmits the data to the transmitter via a non-contact connection that is free from potential interference. The result:

- Automatic error message if sensor fails or connection between sensor and transmitter is interrupted
- Immediate error detection increases measuring point availability

**Input**

**Measured variables**

**Total chlorine**

[mg/l, µg/l, ppm, ppb]

- Free available chlorine:
  - Hypochlorous acid (HOCl)
  - Hypochlorite ions (OCl<sup>-</sup>)
- Combined chlorine (chloramines)
- Organically combined chlorine (e.g. cyanuric acid derivatives)

**Temperature**

[°C, °F]

**Measuring range**

0.1 to 10 mg/l (ppm)

The sensor is not suitable for checking the absence of chlorine.

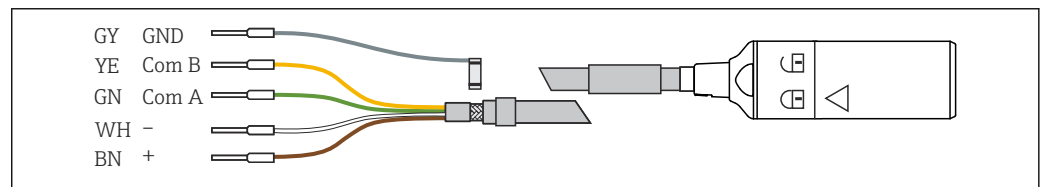
**Signal current**

2.4 to 5.4 nA per 1 mg/l (ppm)

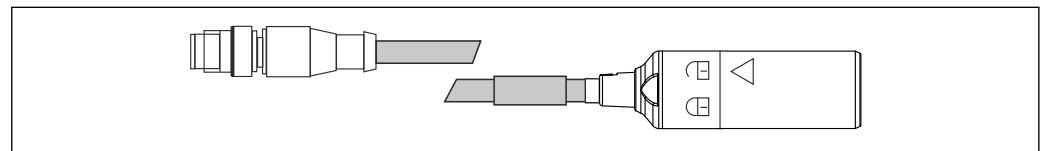
**Energy supply**

**Electrical connection**

The electrical connection to the transmitter is established using the measuring cable CYK10 or CYK20.



3 Measuring cable CYK10 /CYK20



4 CYK10 with M12 plug, electrical connection

## Performance characteristics

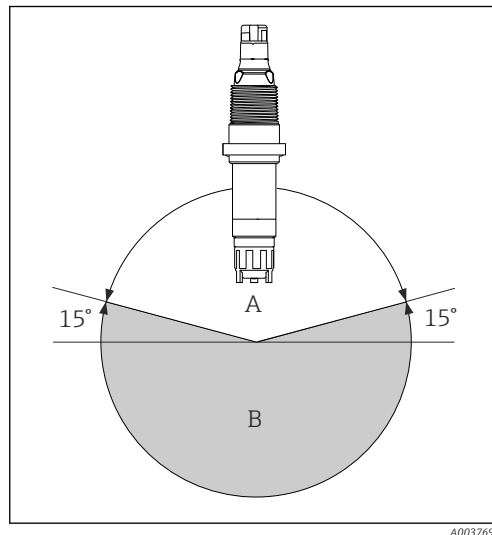
<b>Reference conditions</b>	Temperature	30 °C (86 °F)
	pH value	pH 7.2
<b>Response time</b>	T <sub>90</sub> approx. 60 s (with increasing and decreasing concentration)	
<b>Measured value resolution of sensor</b>	0.01 mg/l (ppm)	
<b>Measurement error</b>	±2 % or 200 µg/l (ppb) of value measured (depending on which value is higher)	
	LOD (limit of detection) <sup>1)</sup>	LOQ (limit of quantification) <sup>1)</sup>
	0.022 mg/l (ppm)	0.072 mg/l (ppm)
	1) Based on ISO 15839. The measured error includes all the uncertainties of the sensor and transmitter (electrode system). It does not contain all the uncertainties caused by the reference material and adjustments that may have been performed.	
<b>Repeatability</b>	0.008 mg/l (ppm)	
<b>Nominal slope</b>	4 nA per 1 mg/l (ppm) (under reference operating conditions)	
<b>Long-term drift</b>	< ±3 % per month	
<b>Polarization time</b>	Initial commissioning	Up to 24 h
	After replacing the membrane cap	Typically 1 to 6 h
	Recommissioning	Pour approx. 4 to 24 h
<b>Operating time of the electrolyte</b>	3 to 6 months (depending on water quality)	
<b>Operating time of membrane cap</b>	With electrolyte	Typically 3 to 6 months, depending on water quality
	Without electrolyte	> 2 years (25 °C (77 °F))

## Installation

### Orientation

Do not install upside-down!

- ▶ Install the sensor in an assembly, support or appropriate process connection at an angle of at least 15 ° to the horizontal.
- ▶ Other angles of inclination are not permitted.
- ▶ Follow the instructions for installing the sensor in the Operating Instructions of the assembly used.



A Permitted orientation  
B Incorrect orientation

### Immersion depth

At least 70 mm (2.76 in)

### Installation instructions

#### Installation in a flow assembly Flowfit CCA250

The Flowfit CCA250 flow assembly is designed for installing the sensor. It allows a pH and an ORP sensor to also be installed, in addition to the total chlorine sensor. A needle valve controls the flow rate in the range of 30 to 120 l/h (7.9 to 31.7 gal/h).

Please note the following during installation:

- ▶ The flow rate must be at least 30 l/h (7.9 gal/h). If the flow drops below this value or stops completely, this can be detected by an inductive proximity switch.
- ▶ If the medium is fed back into an overflow basin, pipe or similar, the resulting counterpressure on the sensor may not exceed 1 bar (14.5 psi) (2 bar abs. (29 psi abs.)) and must remain constant.
- ▶ Negative pressure at the sensor, e.g. due to medium being returned to the suction side of a pump, must be avoided.
- ▶ To avoid buildup, heavily contaminated water should also be filtered.



Additional installation instructions can be found in the Operating Instructions for the assembly.

#### Installation in other flow assemblies

When using other flow assemblies, please ensure the following:

- ▶ A minimum flow velocity of 15 cm/s (0.49 ft/s) must be ensured at the membrane.
- ▶ The flow direction is upwards. Transported air bubbles must be removed so that they do not collect in front of the membrane.
- ▶ The membrane must be exposed to direct flow.

#### Installing the sensor in the CYA112 immersion assembly

Alternatively, the sensor can be installed in an immersion assembly with threaded connection NPT 3/4", e.g. CYA112.

Please note the following during installation:

- ▶ Do not twist the sensor measuring cable. Recommendation: use a quick release fastener.

- ▶ To improve the sealing effect, we recommend you wrap a thin PTFE tape around the thread for assemblies with an NPT 3/4" thread.

 Additional installation instructions can be found in the Operating Instructions for the assembly.

## Environment

<b>Ambient temperature</b>	5 to 45 °C (41 to 113 °F), no temperature fluctuations	
<b>Storage temperature</b>	Without electrolyte	-20 to 60 °C (-4 to 140 °F)
<b>Degree of protection</b>	IP68	

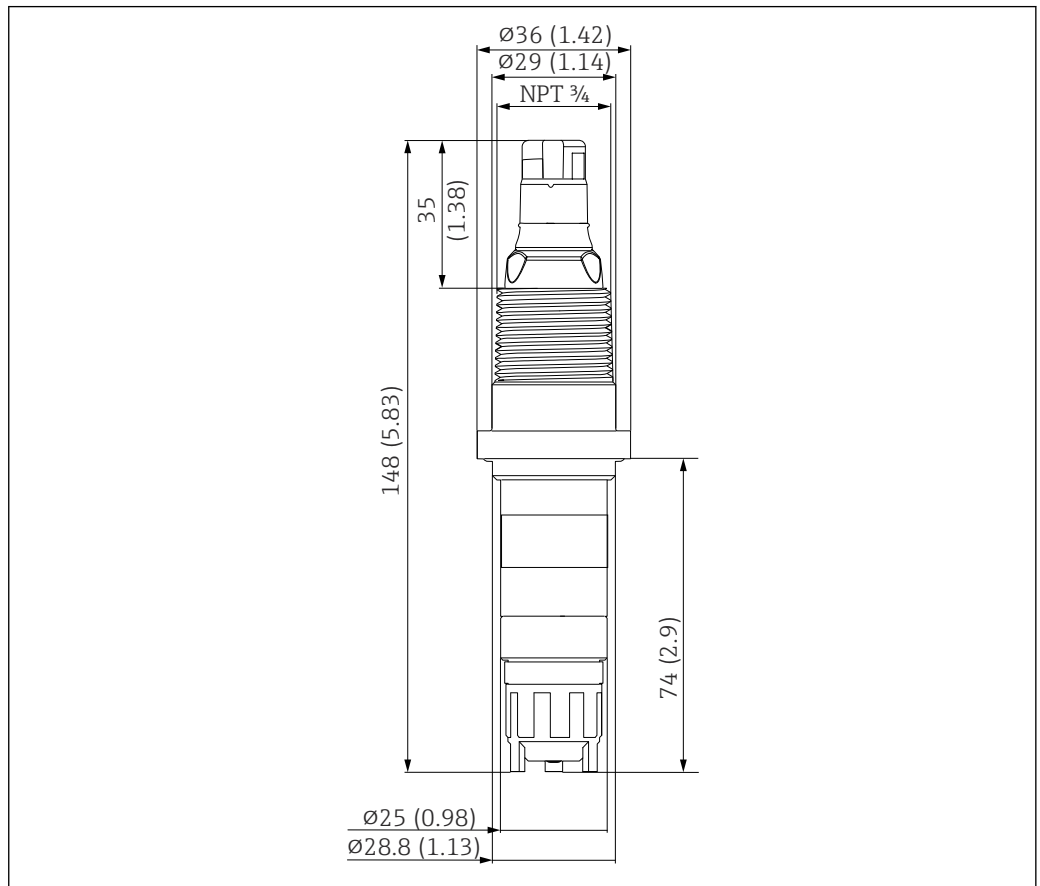
## Process

<b>Process temperature</b>	5 to 45 °C (41 to 113 °F), no temperature fluctuations	
<b>Pressure</b>	Max. 1 bar relativ (14.5 psi relativ) (2 bar abs. (29 psi abs.)), if installed in the Flowfit CCA250 assembly	
<b>pH range</b>	pH5.5 to 9.5 pH dependency: increase from pH 7 to pH 8: approx. -10 % for free chlorine	
<b>Conductivity</b>	0.03 to 40 mS/cm	
<b>Flow</b>	<b>CCA250</b> <ul style="list-style-type: none"> <li>▪ Optimum 40 to 60 l/h (10.6 to 15.8 gal/h)</li> <li>▪ Minimum 30 l/h (7.9 gal/h)</li> <li>▪ Maximum 100 l/h (26.4 gal/h)</li> </ul>	
<b>Minimum flow</b>	<ul style="list-style-type: none"> <li>▪ Optimum 20 to 30 cm/s</li> <li>▪ Minimum 15 cm/s</li> <li>▪ Maximum 50 cm/s</li> </ul>	



## Mechanical construction

### Dimensions



A0038260

5 Dimensions in mm (in)

**Weight** 75 g (2.65 oz)

<b>Materials</b>	Sensor shaft	PVC
	Membrane	PET
	Membrane cap	PPE
	Clamping ring	PTFE
	Hose seal	Silicone
	Electrode body	PMMA

**Cable specification** max. 100 m (330 ft), incl. Cable extension

## Certificates and approvals

Current certificates and approvals that are available for the product can be selected via the Product Configurator at [www.endress.com](http://www.endress.com):

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Configuration**.

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## Ordering information

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**Product page**

[www.endress.com/ccs120d](http://www.endress.com/ccs120d)

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**Product Configurator**

Detailed ordering information is available from your nearest sales organization [www.addresses.endress.com](http://www.addresses.endress.com) or in the Product Configurator at [www.endress.com](http://www.endress.com):

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Configuration**.

**Product Configurator - the tool for individual product configuration**

- Up-to-the-minute configuration data
  - Depending on the device: direct input of information specific to the measuring point, such as the measuring range or operating language
  - Automatic verification of exclusion criteria
  - Automatic creation of the order code and its breakdown in PDF or Excel output format
  - Ability to order directly in the Endress+Hauser Online Shop
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**Scope of delivery**

The scope of delivery comprises:

- Disinfection sensor (membrane-covered)
- Bottle with electrolyte (50 ml (1.69 fl oz)) and nozzle
- Replacement membrane cap
- Operating Instructions
- Manufacturer inspection certificate

## Accessories

The following are the most important accessories available at the time this documentation was issued.

Listed accessories are technically compatible with the product in the instructions.

1. Application-specific restrictions of the product combination are possible. Ensure conformity of the measuring point to the application. This is the responsibility of the operator of the measuring point.
2. Pay attention to the information in the instructions for all products, particularly the technical data.
3. For accessories not listed here, please contact your Service or Sales Center.

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### Device-specific accessories

#### Kit CCS120/120D, maintenance kit

- 2 x membrane caps and 1 x electrolyte 50 ml (1.69 fl.oz)
- Order number: 71412917

#### Kit CCS120/120D, electrolyte

- 1 x electrolyte 50 ml (1.69 fl oz)
- Order number: 71412916

#### Kit CCS120/120D, Viton ring set

- 2 x Viton rings
- Order number: 71105209

#### Memosens data cable CYK10

- For digital sensors with Memosens technology
- Product Configurator on the product page: [www.endress.com/cyk10](http://www.endress.com/cyk10)



Technical Information TI00118C

#### Memosens data cable CYK11

- Extension cable for digital sensors with Memosens protocol
- Product Configurator on the product page: [www.endress.com/cyk11](http://www.endress.com/cyk11)



Technical Information TI00118C

#### Memosens laboratory cable CYK20

- For digital sensors with Memosens technology
- Product Configurator on the product page: [www.endress.com/cyk20](http://www.endress.com/cyk20)

#### Flowfit CCA250

- Flow assembly for disinfection and pH/ORP sensors
- Product Configurator on the product page: [www.endress.com/cca250](http://www.endress.com/cca250)



Technical Information TI00062C

#### Flexdip CYA112

- Immersion assembly for water and wastewater
- Modular assembly system for sensors in open basins, channels and tanks
- Material: PVC or stainless steel
- Product Configurator on the product page: [www.endress.com/cya112](http://www.endress.com/cya112)



Technical Information TI00432C

#### Photometer PF-3

- Compact hand-held photometer for determining the reference measured value
- Color-coded reagent bottles with clear dosing instructions
- Order No.: 71257946

#### Complete quick fastener kit for CYA112

- Adapter, inner and outer parts incl. O-rings
- Tool for mounting and disassembly
- Order No. 71093377 or mounted accessory of CYA112

**COY8**

Zero-point gel for oxygen and disinfection sensors

- Disinfectant-free gel for the verification, zero point calibration and adjustment of oxygen and disinfection measuring points
- Product Configurator on the product page: [www.endress.com/coy8](http://www.endress.com/coy8)



Technical Information TI01244C



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[www.addresses.endress.com](http://www.addresses.endress.com)

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